What is claimed is:

1. An apparatus of transcoding image data in an image display system, the apparatus comprising:

a decoding part decoding an input video data stream in order to restore pixel values of said input data stream;

an encoding part encoding said decoded input video data stream to generate a output video data stream having a different data bit rate; and

an adaptive motion-compensator performing an active global motion compensation on said output video data stream using global motion parameters estimated based on motion and macro-block information of said input video data stream and further performing an active local motion compensation on said output video data stream using said motion information.

2. The apparatus of claim 1, wherein said adaptive motion-compensator includes:

an adaptive motion-controller estimating said global motion parameters if said motion-controller determines that a global motion exists in said motion and macro-block information, said motion parameters representing a camera zoom level and a horizontal camera rotation level;

a global motion-compensator performing said active global motion compensation on said output video data stream by calculating each pixel value of a current frame corresponding to said input video data stream using pixel values of a previous image frame, said previous image frame being determined by using said global motion parameters; and

a local motion-compensator performing said active local motion compensation on said output video data stream.

3. The apparatus of clam 2, wherein said adaptive motion-controller determines whether said global motion exists in said motion information by comparing a first number of intra macro blocks and a second number of non-intra macro blocks of said motion and macro-block information.

4. The apparatus of claim 2, wherein said adaptive motion-controller estimates said global motion parameters by initially determining an error value of said current image frame by $E(a,\vec{b})=\sum_{i}\left|\hat{U}_2-U_2\right|^2$, setting previous global motion parameter values as said global motion parameters if said error value is less than a limiting value, and newly estimating said global motion parameters if said error value is greater than or equal to said limiting value, where a and $\vec{b}$ represent said global motion

parameters, and $\hat{U}_2$ and U_2 represent image coordinates of said current image frame before and after a camera motion, respectively.

5. The apparatus of claim 4, wherein said global motion parameters are newly estimated by

$$a = \frac{\sum\langle U_2, U_1\rangle - \frac{1}{N}\langle \sum U_2, \sum U_1\rangle}{\sum\langle U_1, U_1\rangle - \frac{1}{N}\langle \sum U_1, \sum U_1\rangle} \text{ and}$$

$$\vec{b} = \frac{1}{N}\left(\sum U_2 - a \bullet \sum U_1\right),$$

where

$\langle,\rangle$ represents an inner product operation,

U_1 represents image coordinates of said previous image frame, and

U_2 represents image coordinates of said current image frame.

6. The apparatus of claim 1, wherein said global motion compensation is performed by using a bi-linear interpolation method.

7. The apparatus of claim 2, wherein said global motion-compensator performs said active global motion compensation by initially determining a frame location of said previous image

frame by $I_t(U_2) = I_{t-1}(U_1) = I_{t-1}\left(\frac{1}{a}\left[U_2 - \vec{b}\right]\right)$ and calculating each pixel value of said current image frame by

$$\begin{aligned} I_t(x_2, y_2) = I_{t-1}(x_1, y_1) \\ &+\alpha\left[I_{t-1}(x_1+1, y_1) - I_{t-1}(x_1, y_1)\right] \\ &+\beta\left[I_{t-1}(x_1, y_1+1) - I_{t-1}(x_1, y_1)\right] \\ &+\alpha\beta\left[I_{t-1}(x_1, y_1) - I_{t-1}(x_1, y_1+1) + I_{t-1}(x_1+1, y_1+1) - I_{t-1}(x_1+1, y_1)\right] \end{aligned}$$

, where α and β are fractional numbers of each pixel location (x_2, y_2) of said current frame in said previous frame.

8. The apparatus of claim 2, wherein sad local motion-compensator performs said active local motion compensation based on a local motion of said output video data stream.

9. The apparatus of claim 8, wherein said local motion is estimated based on said motion and macro-block information of said input video data stream by using a block-matching technique.

10. The apparatus of claim 8, wherein said local motion is estimated based on motion and macro-block information of said previous image frame.

11. A method of transcoding image data in a digital TV system, the method comprising the steps of:

(a) determining whether a global motion exists in a current image frame received using motion and macro-block information of said current image frame;

(b) estimating global motion parameters if said global motion exists in said current image frame, said global motion parameters representing a camera zoom level and a horizontal camera rotation level;

(c) performing a global motion compensation on said current image frame if said global motion exists in said current image frame by calculating each pixel value of said current image frame using its corresponding pixel values of a previous image frame, said previous image frame being determined by using said global motion parameters; and

(d) further performing local motion compensation on said current image frame.

12. The method of claim 11, wherein, in the step (a), whether said global motion exists in said current image frame is determined by comparing a first number of intra macro blocks and a second number of non-intra macro blocks of said motion and macro-block information of said current image frame.

13. The method of claim 11, wherein the step (b) includes:

(b1) determining an error value of said current image frame by using the following equation if said global motion exists in said current image frame

$$E(a,\vec{b}) = \sum_{i} \left| \hat{U}_2 - U_2 \right|^2 ,$$

where a and $\vec{b}$ represent said global motion parameters, and $\hat{U}_2$ and U_2 represent image coordinates of said current image frame before and after a camera motion, respectively;

(b2) setting previous global motion parameter values as said first and second global motion parameters if said error value is less than a limiting value, said previous first and second parameter values being estimated earlier for compensating said previous image frame; and

(b3) newly estimating said global motion parameters if said error value is greater than or equal to said limiting value.

14. The method of claim 13, wherein in the step (b3), said global motion parameters are newly estimated by

$$a = \frac{\sum\langle U_2, U_1\rangle - \frac{1}{N}\langle \sum U_2, \sum U_1\rangle}{\sum\langle U_1, U_1\rangle - \frac{1}{N}\langle \sum U_1, \sum U_1\rangle} \text{ and}$$

$$\vec{b} = \frac{1}{N}\left(\sum U_2 - a \bullet \sum U_1\right),$$

where

$\langle , \rangle$ represents an inner product operation,

U_1 represents image coordinates of said previous image frame, and

U_2 represents image coordinates of said current image frame.

15. The method of claim 11, wherein said global motion compensation is performed by using a bi-linear interpolation method.

16. The method of claim 11, wherein the step (c) includes:

(c1) determining a frame location of said previous image frame for compensating said current image frame by using

$$I_t(U_2) = I_{t-1}(U_1) = I_{t-1}\left(\frac{1}{a}\left[U_2 - \vec{b}\right]\right) \text{ ; and}$$

(c2) determining each pixel value of said current image frame by

$$\begin{aligned} I_t(x_2, y_2) = I_{t-1}(x_1, y_1) \\ &+ \alpha\left[I_{t-1}(x_1+1, y_1) - I_{t-1}(x_1, y_1)\right] \\ &+ \beta\left[I_{t-1}(x_1, y_1+1) - I_{t-1}(x_1, y_1)\right] \\ &+ \alpha\beta\left[I_{t-1}(x_1, y_1) - I_{t-1}(x_1, y_1+1) + I_{t-1}(x_1+1, y_1+1) - I_{t-1}(x_1+1, y_1)\right] \end{aligned}$$

, where α and β are fractional numbers of each pixel location (x_2, y_2) of said current frame in said previous frame.

17. The method of claim 11, wherein the step (d) includes the steps of:

(d1) estimating a local motion of said current image frame; and

(d2) performing said local motion compensation on current image frame using said local motion estimated.

18. The method of claim 17, wherein said local motion is estimated based on said motion and macro-block information of said current image frame by using a block-matching technique.

19. The method of claim 17, wherein said local motion is estimated based on motion information of said previous image frame.